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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Katsuyo IWASAKI

Docket: 10873.569US01

Title: COLOR CATHODE-RAY TUBE AND COLOR CATHODE-RAY TUBE APPARATUS

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CERTIFICATE UNDER 37 CFR 1.10
'Express Mail' mailing label number: EL674895475US
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By: Linda McCormick
Name: Linda McCormick

BOX PATENT APPLICATION
Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

We are transmitting herewith the attached:

- ☒ Transmittal sheet, in duplicate, containing Certificate under 37 CFR 1.10.
- ☒ Utility Patent Application: Spec. 11 pgs; 15 claims; Abstract 1 pgs.
  The fee has been calculated as shown below in the 'Claims as Filed' table.
- ☒ 12 sheets of formal drawings
- ☒ Certified copy of a Japanese application, Serial No. 11-311998, filed November 2, 1999, the right of priority of which is claimed under 35 U.S.C. 119
- ☒ A signed Combined Declaration and Power of Attorney
- ☒ Assignment of the invention to Matsushita Electronics Corporation, Recordation Form Cover Sheet
- ☒ A check in the amount of $690.00 to cover the Filing Fee
- ☒ A check for $40.00 to cover the Assignment Recording Fee.
- ☒ Other: Preliminary Amendment, Communication re: submission of priority document
- ☒ Return postcard

CLAIMS AS FILED

Number of Claims Filed		In Excess of:		Number Extra		Rate		Fee
Basic Filing Fee								$690.00
Total Claims								
15	-	20	=	0	x	18.00	=	$0.00
Independent Claims								
3	-	3	=	0	x	78.00	=	$0.00
MULTIPLE DEPENDENT CLAIM FEE								$0.00
TOTAL FILING FEE								$690.00

Please charge any additional fees or credit overpayment to Deposit Account No. 13-2725. A duplicate of this sheet is enclosed.

By: _____
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23552
PATENT TRADEMARK OFFICE

(PTO TRANSMITTAL - NEW FILING)

S/N unknown PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	Katsuyo IWASAKI	Serial No.:	unknown
Filed:	concurrent herewith	Docket No.:	10873.569US01
Title:	COLOR CATHODE-RAY TUBE AND COLOR CATHODE-RAY TUBE APPARATUS		

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By: Linda McCormick
Name: Linda McCormick

09/675475 092800

PRELIMINARY AMENDMENT

Assistant Commissioner for Patents
Washington, D. C. 20231

Dear Sir:

In connection with the above-identified application filed herewith, please enter the following preliminary amendment:

IN THE CLAIMS

In claim 13, line 2, please delete "any one of the" and insert --a--, delete "tubes" and insert --tube--, delete "claims 1, 2, and 9;" and insert --claim 1;--

Please add the following new claims:

14. (new) A color cathode-ray tube apparatus comprising:

a color cathode-ray tube according to claim 2; and

a deflection yoke for generating a pincushion-type horizontal deflection magnetic field and a barrel-type deflection magnetic field.

15. (new) A color cathode-ray tube apparatus comprising:

a color cathode-ray tube according to claim 9; and

a deflection yoke for generating a pincushion-type horizontal deflection magnetic field and a barrel-type deflection magnetic field.

REMARKS

The above preliminary amendment is made to remove multiple dependencies from claim 13 and to add new claims 14 and 15.

Applicants respectfully request that the preliminary amendment described herein be entered into the record prior to calculation of the filing fee and prior to examination and consideration of the above-identified application.

If a telephone conference would be helpful in resolving any issues concerning this communication, please contact Applicants' primary attorney-of record, Douglas P. Mueller (Reg. No. 30,300), at (612) 371.5237.

Respectfully submitted,

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Dated: September 28, 2000

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Douglas P. Mueller
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COLOR CATHODE-RAY TUBE AND COLOR CATHODE-RAY TUBE APPARATUS

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates generally to a color cathode-ray tube with an in-line electron gun and a color cathode-ray tube apparatus using the same.

2. Related Background Art

In a color cathode-ray tube apparatus provided with an in-line electron gun, a horizontal deflection magnetic field and a vertical deflection magnetic field are provided with strong pincushion (FIG. 8) and barrel (FIG. 9) distortions, respectively, for the purpose of self-convergence. The influences accompanying this are found in focus and convergence. In other words, as shown in FIG. 12, the shapes of beam spots, which rightfully should be perfect circles, are distorted due to deflections as follows. In the upper and lower portions of the screen, the shapes of beam spots are horizontally elongated and also are rotated. In the left and right portions of the screen, they are horizontally elongated, wherein the distortion levels are different between side beams, and haze (indicated with broken lines in FIG. 12) is caused due to upward and downward blurs of beam spots. At the diagonal corners of the screen, the beam spots have shapes such as those obtained when the horizontally long shapes are rotated and furthermore, the sizes of haze areas are different between side beams. Any of the above is one of the factors causing the deterioration in image quality. Furthermore, with respect to the convergence, the convergent point of a center beam (G) is different from those of side beams (B, R), which has caused color position shifts (not shown in figures).

In view of such occurrences, conventionally, in order to improve the convergence of three-color beam spots and the shapes of the beam spots in the upper and lower portions of a screen simultaneously, for example, JP 5-36894 B discloses a method in which magnetic pieces are attached to a rear end portion of a deflection yoke and a rear end part of a vertical magnetic field is distorted locally in a pincushion form.

In order to improve the convergence of the center beam relative to that of the side beams in the upper, lower, left, and right portions of the

screen, for example, JP 57-172636 A and JP 54-146572 A employ a method in which magnetic pieces are provided at an end of an electron gun and the strength of a magnetic field acting on the center beam is varied relative to the strengths of magnetic fields acting on the side beams, thus adjusting the convergence.

In the aforementioned conventional inventions, however, spot distortions in the left and right portions of the screen and the asymmetry in the spot distortions of side beams with respect to each other cannot be corrected, although the convergence of the center beam relative to those of the side beams and the spot shapes in the upper and lower portions of the screen are improved. Thus, the problem of the deterioration in image quality has remained.

This is described with reference to FIG. 11. When beams travel in a direction from the back side to the front side of the paper and are deflected to the right, a pincushion magnetic field is directed upward. In this case, beams B, G and R are subjected to a deflection force and at the same time, a distortion force causing the spot shapes of the beams to be horizontally elongated by a force in a direction perpendicular to that of the magnetic field. Since the beam R is positioned to the right with respect to the beam B, it therefore is subjected to a constant and strong distortion effect, which makes the shape of the beam R horizontally longer, thus causing the asymmetry of the beams B and R with respect to each other, as to the degrees to which their spot shapes are horizontally elongated.

SUMMARY OF THE INVENTION

In view of the above-mentioned points, the present invention is intended to provide a color cathode-ray tube and a color cathode-ray tube apparatus that enable focus quality to be improved by generating magnetic fields, on a neck side, with respect to three beams, respectively, for reverse correction of spot distortions to improve the symmetry in the spot distortions of side beams asymmetric with each other.

A first color cathode-ray tube of the present invention includes an in-line electron gun. In the first cathode-ray tube, side beams of three electron beams are allowed to pass through localized barrel magnetic fields formed in a direction substantially perpendicular to an in-line plane and corresponding to the side beams, respectively. Thus, cross-sectional shapes of the side beams are varied so that the cross-sectional shape of one of the

side beams is horizontally or vertically elongated to a higher degree than that to which the cross-sectional shape of the other of the side beams is.

According to this, before the electron beams enter a deflection magnetic field, the cross-sectional shapes of the electron beams are varied depending on the asymmetry in the spot shapes of the side beams with respect to each other. Therefore, the nonuniformity in the spot shapes can be improved.

A second color cathode-ray tube of the present invention includes an in-line electron gun. In the second color cathode-ray tube, at the end, on a screen side, of the electron gun, two pairs of members for generating a magnetic field are placed above and below side beams of three electron beams so as to sandwich them, respectively. Between each of the pairs of members for generating a magnetic field, a localized barrel magnetic field is formed to vary cross-sectional shapes of the side beams so that the cross-sectional shape of one of the side beams is horizontally or vertically elongated to a higher degree than that to which the cross-sectional shape of the other of the side beams is.

According to this, the side beams are subjected to the localized barrel magnetic fields before entering a deflection yoke, thus varying the cross-sectional shapes of the side beams.

In the second color cathode-ray tube, it is preferable that the strength of the localized magnetic field formed between each of the pairs of members for generating a magnetic field varies depending on the level of horizontal deflection.

This enables the strengths of the localized barrel magnetic fields affecting the side beams to vary depending on the levels of the distortions of spot shapes.

In the second color cathode-ray tube, it is preferable that the localized magnetic field formed between each of the pairs of members for generating a magnetic field is induced by a horizontal deflection magnetic field generated by the deflection yoke.

According to this, the strengths of the localized barrel magnetic fields affecting the side beams can be varied depending on the level of the horizontal deflection.

In the second color cathode-ray tube, it is preferable that the members for generating a magnetic field have plate-like magnetic bodies placed in planes perpendicular to an in-line direction and parallel to a

direction in which the electron beams travel and the plate-like magnetic bodies are positioned in locations shifted inward from planes passing through the central axes of the side beams.

According to this, with a relatively simple configuration, the localized barrel magnetic fields are allowed to act on the side beams. Furthermore, by setting the space between the magnetic bodies to be narrower than that between the side beams, the strengths of the magnetic fields acting on the side beams are allowed to be uneven in cross-sectional planes of the beams and the magnetic fields act on the left and right side beams differently. Therefore, it is possible to vary one of the side beams to have a horizontally elongated cross-sectional shape and the other of the side beams to have a vertically elongated cross-sectional shape.

In the second color cathode-ray tube, it is preferable that ends, on the electron beam side, of the plate-like magnetic bodies are bent and thus planes parallel to the in-line direction are formed.

According to this, areas on which the localized barrel magnetic fields act are broadened, thus improving the effect of correcting the spot distortions.

Furthermore, in the second color cathode-ray tube, it is preferable that the members for generating a magnetic field are four substantially V-shaped magnetic pieces attached to an inner face of a cylindrical body.

According to this, the members for generating a magnetic field can be provided with a relatively simple configuration and therefore can be attached to the end of the electron gun easily.

In the second color cathode-ray tube, it also is preferable that a further pair of members for generating a magnetic field is placed above and below the center beam of the three electron beams so as to sandwich it, thus allowing a localized barrel magnetic field to act on the center beam.

According to this, the magnetic flux density affecting the center beam can be adjusted, thus providing an allowance for the adjustment of convergence.

A third color cathode-ray tube of the present invention includes an in-line electron gun. In the third color cathode-ray tube, at the end, on a screen side, of the electron gun, two pairs of plate-like members are placed above and below side beams of three electron beams so as to sandwich them, respectively. The plate-like members have plate-like magnetic bodies placed in planes perpendicular to an in-line direction and parallel to a

direction in which the electron beams travel and the plate-like magnetic bodies are positioned in locations shifted inward from planes passing through the central axes of the side beams.

According to this, with a relatively simple configuration, localized barrel magnetic fields are allowed to act on the side beams. Furthermore, by setting the space between the magnetic bodies to be narrower than that between the side beams, the strengths of the magnetic fields acting on the side beams are allowed to be uneven in cross-sectional planes of the beams and the magnetic fields act on the left and right side beams differently. Therefore, it is possible to vary one of the side beams to have a horizontally elongated cross-sectional shape and the other of the side beams to have a vertically elongated cross-sectional shape. As a result, the nonuniformity in the spot shapes of the side beams can be improved.

In the third color cathode-ray tube, it is preferable that ends, on the electron beam side, of the plate-like magnetic bodies are bent and thus planes parallel to the in-line direction are formed.

According to this, areas on which the localized barrel magnetic fields act are broadened, thus improving the effect of correcting spot distortions.

Furthermore, in the third color cathode-ray tube, it is preferable that the plate-like members are four substantially V-shaped magnetic pieces attached to an inner face of a cylindrical body.

According to this, the members for generating a magnetic field can be provided with a relatively simple configuration and therefore can be attached to the end of the electron gun easily.

In the third color cathode-ray tube, it also is preferable that a further pair of plate-like members is placed above and below the center beam of the three electron beams so as to sandwich it and the plate-like members have plate-like magnetic bodies placed in a plane that is perpendicular to the in-line direction and passes through the central axis of the center beam.

According to this, the magnetic flux density affecting the center beam can be adjusted, thus providing an allowance for the adjustment of convergence.

In addition, a color cathode-ray tube apparatus of the present invention includes any one of the first to third color cathode-ray tubes and a deflection yoke for generating a pincushion-type horizontal deflection magnetic field and a barrel-type vertical deflection magnetic field.

According to this, the symmetry in the spot distortions of the side

beams asymmetric with each other is improved, thus providing a color cathode-ray tube apparatus with an improved focus quality.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of members for generating a magnetic field of the present invention.

FIG. 2 is an enlarged view of an end of an electron gun.

FIG. 3 is a front view of the members for generating a magnetic field of the present invention.

FIG. 4 shows a manner in which localized barrel magnetic fields act on side beams.

FIG. 5 shows a side view, partially in section, of a color cathode-ray tube apparatus according to the present invention.

FIG. 6 is a front view of members for generating a magnetic field according to a second embodiment of the present invention.

FIG. 7 is a front view of members for generating a magnetic field according to a third embodiment of the present invention.

FIG. 8 is a conceptual diagram of a horizontal deflection magnetic field provided with a pincushion distortion in a conventional color cathode-ray tube apparatus.

FIG. 9 is a conceptual diagram of a vertical deflection magnetic field provided with a barrel distortion in the conventional color cathode-ray tube apparatus.

FIG. 10 is a drawing showing spot shapes in the present invention.

FIG. 11 is a drawing showing a manner in which a horizontal deflection magnetic field acts on electron beams in the conventional color cathode-ray tube apparatus.

FIG. 12 is a drawing showing spot shapes in the conventional color cathode-ray tube apparatus.

DETAILED DESCRIPTION OF THE INVENTION

Embodiments of the present invention are described with reference to the drawings as follows.

Embodiment 1

FIG. 5 shows a side view, partially in section, of a color cathode-ray tube apparatus illustrating an embodiment of the present invention. The color cathode-ray tube apparatus includes a glass envelope formed of a

rectangular panel 1 and a funnel 2 provided to form one body with the panel 1. On the inner face of the panel 1, a phosphor screen 4 made of phosphors with three colors is formed. A shadow mask 5 for color selection is attached opposing the phosphor screen 4 at a predetermined distance therefrom. Inside a neck portion 3 positioned at the rear of the funnel 2, an electron gun 9 for generating three electron beams 6 is provided. A deflection yoke 7 for deflecting three electron beams 6 vertically and horizontally and a so-called convergence yoke 8 for adjusting color position shifts and color unevenness at the center of the screen are provided around the neck portion 3.

The deflection yoke 7 is provided with a horizontal coil (not shown in the figure) for generating a horizontal deflection magnetic field with a strong pincushion distortion (FIG. 8) and a vertical coil (not shown in the figure) for generating a vertical deflection magnetic field with a strong barrel distortion (FIG. 9) so as to deflect the three electron beams 6 and also automatically to correct color position shifts occurring throughout the screen and distortion of a raster in the upper and lower portions of the screen to obtain a straight raster.

FIG. 2 shows an enlarged view of the end, on the screen side, of the electron gun 9. Focusing electrodes 51 and 52 are fixed to a support rod 53. To the end, on the screen side, of the focusing electrode 52, a so-called top unit 10 is fixed in a current-carrying state. As shown in FIG. 1, the top unit 10 includes a cup-shaped member having a cylindrical portion 22 and a bottom 21 provided with three electron beam through-holes 20. In the cup-shaped member, two pairs of field controllers 11, 11', 12, and 12' formed of substantially V-shaped magnetic pieces are provided as members for generating a magnetic field (plate-like members) while being in contact with and being held by the inner face of the cylindrical portion 22. The field controllers 11, 11', 12, and 12' are placed above and below side beams of three electron beams so as to sandwich them, respectively. The field controllers 11, 11', 12, and 12' have vertical planar parts 13, 13', 14, and 14' and attachment parts 15, 15', 16, and 16', respectively. The vertical planar parts 13, 13', 14, and 14' are positioned in planes perpendicular to the in-line direction (a direction in which the three electron beams are arranged) and parallel to a direction in which the electron beams travel. The attachment parts 15, 15', 16, and 16' are placed along the inner face of the cylindrical portion 22. As shown in FIG. 3, a pair of vertical planar parts 13 and 13' and a pair of vertical planar parts 14 and 14' are positioned in the same

planes, respectively. The respective planes are positioned in locations shifted inward (toward the center beam) from planes that pass through the central axes of the side beams and are perpendicular to the in-line direction. They are positioned at the same interval from a vertical axis (an axis passing through a tube axis in a vertical direction).

The top unit 10 with the configuration described above is attached in an area where a horizontal deflection magnetic field is formed by the deflection yoke 7 or in the vicinity of the entrance of the area.

Next, a function of the field controllers is described with reference to FIG. 4.

In the case where electron beams are deflected to the right when being seen from the screen side, pincushion-type horizontal deflection magnetic fields 30 are directed upward. Initially, the magnetic fields are absorbed by the attachment parts 15' and 16' of the field controllers 11' and 12' on the lower side. The absorbed magnetic fields are transmitted from the vertical planar parts 13' and 14' to the vertical planar parts 13 and 14, and then pass through the attachment parts 15 and 16, respectively, to go out from the field controllers. Localized magnetic fields 31 formed when the absorbed magnetic fields are transmitted from the vertical planar parts 13' and 14' to the vertical planar parts 13 and 14 are formed in barrel shapes with respect to the axis extending between the vertical planar parts 13 and 13' and the axis extending between the vertical planar parts 14 and 14', respectively.

The central axes of the barrel-type localized magnetic fields 31 are positioned on the inner sides of both side beam axes. Therefore, the directions of forces acting on a red electron beam R and a blue electron beam B passing through the localized magnetic fields 31 are different from each other. When entering the localized magnetic field 31, the red electron beam R (indicated with a broken line) with a perfectly circular cross-section is subjected to a so-called barrel-type magnetic field. An outward force (indicated with an arrow) acts on the inner side (on the side of a green electron beam G) of the cross-section of the red electron beam R. On the other hand, the outer side of the cross-section is subjected to a force (indicated with arrows) in directions perpendicular to that of the magnetic field. As a result, the red electron beam R as a whole is displaced outward and the shape of its cross-section is varied to be vertically long (indicated with a solid line). When entering the localized magnetic field 31, a blue

electron beam B (indicated with a broken line) with a perfectly circular cross-section is subjected to a so-called pincushion-type magnetic field. An inward force (indicated with arrows) acts on the outer side (on the opposite side to the green electron beam G) of the cross-section of the blue electron beam B. On the other hand, the inner side of the cross-section is subjected to a force (indicated with an arrow) in a direction perpendicular to that of the magnetic field. As a result, the blue electron beam B as a whole is displaced inward and the shape of its cross-section is varied to be horizontally long (indicated with a solid line). Consequently, the asymmetry in the spot distortions of the side beams with respect to each other occurring when they reach the screen is improved.

The strength of the localized magnetic fields 31 is adjusted as follows. By increasing one or both of the length and the width (the length in the tube axis direction) of the attachment parts 15, 15', 16, and 16' of the field controllers to increase the areas of the attachment parts, the absorption of the horizontal deflection magnetic field by the attachment parts is increased. Thus, the strength of the localized magnetic fields is enhanced. Further, the increase in width (the length in the tube axis direction) of the vertical planar parts 13, 13', 14, and 14' of the field controllers allows the areas where the localized magnetic fields act on the electron beams to be longer, thus obtaining a higher effect.

Preferable sizes, as examples, of the respective members of the present embodiment are described as follows. The size of the cathode-ray tube is 46 cm (19 inches). The diameter of the neck is 29.1 mm. The cylindrical portion 22 of the top unit 10 has a diameter of 21.5 mm. The width (the length in the tube axis direction) of the top unit 10 is 8 mm. Each of the attachment parts 15, 15', 16, and 16' and each of the vertical planar parts 13, 13', 14, and 14' of the V-shaped field controllers have a length of 6 mm and a length of 4.5 mm, respectively. Each field controller has a width (a length in the tube axis direction) of 3 mm and a thickness of 0.1 mm. The interval between respective centers of the electron beam through holes 20 is 5.5 mm. The diameter of each electron beam through hole 20 is 3 mm. Each space between the vertical planar parts 13 and 14, and 13' and 14' is 7 mm. Therefore, the respective vertical planar parts are positioned in locations shifted toward the center by 2 mm from the centers of the electron beam through holes on the both sides. Besides a Permalloy, other materials may be used for the field controllers 11, 11', 12, 12' and the

cylindrical portion 22 of the top unit 10 as long as they are high permeability materials such as a μ-Metal (a Ni42%-Fe alloy) or the like. The workability during manufacturing is improved with the increase in thickness of the respective parts of the top unit.

According to the present invention, as shown in FIG. 10, the distortions of spot shapes are corrected at the periphery of the screen and the spot shapes approach perfect circles to a higher degree compared to the conventional spot shapes shown in FIG. 12. Values indicating levels of the asymmetry include a value of a voltage (a focus voltage) applied when respective beams are focused precisely. Conventionally, with respect to a red electron beam, there has been a difference of about 200 V in focus voltages in the right and left portions of the screen. In the present invention, however, the difference is reduced to 40 V or less and thus it was made possible that the difference falls within a substantial adjustment error tolerance.

The localized magnetic fields 31 formed by the field controllers are induced by the horizontal deflection magnetic field generated by the deflection yoke 7. The strengths of the localized magnetic fields 31 vary with that of the horizontal deflection magnetic field generated by the deflection yoke 7. Generally, the level of the asymmetry in the spot distortions of side beams with respect to each other varies with that of the deflection in the horizontal direction. According to the present invention, therefore, correction can be performed depending on the level of the asymmetry.

Second Embodiment

In the present embodiment, as shown in FIG. 6, substantially T-shaped field controllers 61 and 61' are provided on the vertical axis in addition to the above-mentioned V-shaped field controllers 11, 11', 12, and 12' to adjust the magnetic flux density affecting the center beam relative to that affecting the side beams. Thus, an allowance for the adjustment of convergence is provided.

When a localized magnetic field corresponding to the center green electron beam G is generated, the localized magnetic field is superimposed on a horizontal deflection magnetic field acting on the green electron beam G. Therefore, the level of the horizontal deflection of the green electron beam G is increased. Consequently, the misconvergence that a vertical line of the green electron beam G is displayed in a location inward with respect to

vertical lines of the blue electron beam B and the red electron beam R can be corrected in both left and right end portions of the screen.

In the respective T-shaped field controllers 61 and 61', a part attached to a cylindrical portion has a length of 4 mm and the length of vertical planar parts 61a and 61a' is 7.5 mm. The vertical planar parts 61a and 61a' are placed in a plane that is perpendicular to the in-line direction and passes through the central axis (a tube axis) of the center beam.

Third Embodiment

In the present embodiment, as shown in FIG. 7, ends of respective vertical planar parts 13, 13' 14, and 14' of field controllers are bent outward to provide bent parts 71, 71', 72, and 72', with a length of about 2mm, substantially parallel to the in-line direction, thus broadening the areas of magnetic fields to be generated.

According to the present embodiment, the areas of magnetic fields acting on beams are broadened and the effect of correcting spot shapes is improved when compared to the case where the bent parts 71, 71', 72, and 72 are not provided. In this case, it is preferable that with respect to the in-line direction, the tips of the bent parts 71, 71', 72, and 72 are positioned on the central axes of the side beams B and R.

In the present embodiment, the T-shaped field controllers 61 and 61' for generating a localized magnetic field acting on the center beam as described in the second embodiment also may be provided.

The invention may be embodied in other forms without departing from the spirit or essential characteristics thereof. The embodiments disclosed in this application are to be considered in all respects as illustrative and not limiting. The scope of the invention is indicated by the appended claims rather than by the foregoing description, and all changes which come within the meaning and range of equivalency of the claims are intended to be embraced therein.

00625742.050202

WHAT IS CLAIMED IS:

1. A color cathode-ray tube comprising an in-line electron gun,

wherein side beams of three electron beams pass through localized barrel magnetic fields formed, in a direction substantially perpendicular to an in-line plane, corresponding to the side beams, respectively, and cross-sectional shapes of the side beams are varied so that the cross-sectional shape of one of the side beams is horizontally or vertically elongated to a higher degree than that to which the cross-sectional shape of the other of the side beams is.

2. A color cathode-ray tube comprising an in-line electron gun,

wherein at an end, on a screen side, of the electron gun, two pairs of members for generating a magnetic field are placed above and below side beams of three electron beams so as to sandwich them, respectively, and

between each of the two pairs of members for generating a magnetic field, a localized barrel magnetic field is formed to vary cross-sectional shapes of the side beams so that the cross-sectional shape of one of the side beams is horizontally or vertically elongated to a higher degree than that to which the cross-sectional shape of the other of the side beams is.

3. The color cathode-ray tube according to claim 2, wherein a strength of the localized magnetic field formed between each of the two pairs of members for generating a magnetic field varies depending on a level of horizontal deflection.

4. The color cathode-ray tube according to claim 2, wherein the localized magnetic field formed between each of the two pairs of members for generating a magnetic field is induced by a horizontal deflection magnetic field generated by a deflection yoke.

5. The color cathode-ray tube according to claim 2, wherein the two pairs of members for generating a magnetic field have plate-like magnetic bodies placed in planes perpendicular to an in-line direction and parallel to a direction in which the three electron beams travel, and

the plate-like magnetic bodies are positioned in locations shifted inward from planes passing through central axes of the side beams.

6. The color cathode-ray tube according to claim 5, wherein ends, on a side of the electron beams, of the plate-like magnetic bodies are bent and planes parallel to the in-line direction are formed.

7. The color cathode-ray tube according to claim 2, wherein the two pairs of members for generating a magnetic field are four substantially V-shaped magnetic pieces attached to an inner face of a cylindrical body.

8. The color cathode-ray tube according to claim 2, wherein a further pair of members for generating a magnetic field is placed above and below a center beam of the three electron beams so as to sandwich it, thus allowing a localized barrel magnetic field to act on the center beam.

9. A color cathode-ray tube comprising an in-line electron gun,

wherein at an end, on a screen side, of the in-line electron gun, two pairs of plate-like members are placed above and below side beams of three electron beams so as to sandwich them, respectively,

the two pairs of plate-like members have plate-like magnetic bodies placed in planes perpendicular to an in-line direction and parallel to a direction in which the three electron beams travel, and

the plate-like magnetic bodies are positioned in locations shifted inward from planes passing through central axes of the side beams.

10. The color cathode-ray tube according to claim 9, wherein ends, on a side of the electron beams, of the plate-like magnetic bodies are bent and planes parallel to the in-line direction are formed.

11. The color cathode-ray tube according to claim 9, wherein the two pairs of plate-like members are four substantially V-shaped magnetic pieces attached to an inner face of a cylindrical body.

12. The color cathode-ray tube according to claim 9, wherein a further pair of plate-like members is placed above and below a center beam of the three electron beams so as to sandwich it, and

the further pair of plate-like members has plate-like magnetic bodies placed in a plane that is perpendicular to the in-line direction and passes through a central axis of the center beam.

13. A color cathode-ray tube apparatus comprising:

any one of the color cathode-ray tubes according to claims 1, 2, and 9; and

a deflection yoke for generating a pincushion-type horizontal deflection magnetic field and a barrel-type vertical deflection magnetic field.

0965424 - 960606

ABSTRACT

A color cathode-ray tube including an in-line electron gun and a color cathode-ray tube apparatus including the same are provided. At an end, on a screen side, of the electron gun, two pairs of members for generating a magnetic field are placed above and below side beams of three electron beams so as to sandwich them, respectively. Between each of the two pairs of members for generating a magnetic field, a localized barrel magnetic field is formed to vary cross-sectional shapes of the side beams positioned on both sides of a center beam so that the cross-sectional shape of one of the side beams is horizontally or vertically elongated to a higher degree than that to which the cross-sectional shape of the other of the side beams is. Magnetic fields for reverse correction of spot distortions of the side beams are generated and therefore the symmetry in the spot distortions of the side beams asymmetric with each other is improved, thus improving focus quality.

"Express Mail" mailing label number EL674895475US
Date of Deposit September 28, 2000
I hereby certify that this paper or fee is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 CFR 1.10 on the date indicated above and is addressed to: Assistant Commissioner for Patents, Washington, D.C. 20231.
Linda McCormick
(printed name)
Linda McCormick
(signature)

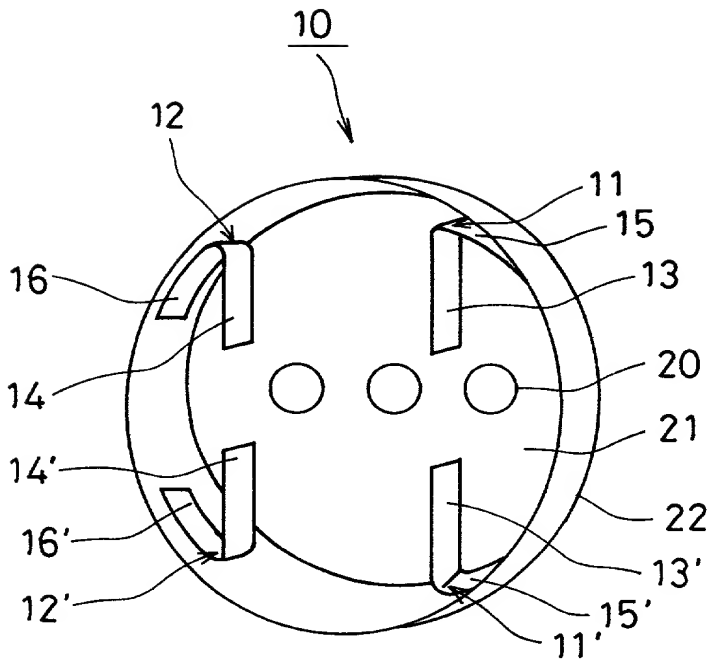

FIG. 1

09675425 - 092800

09675424.090209

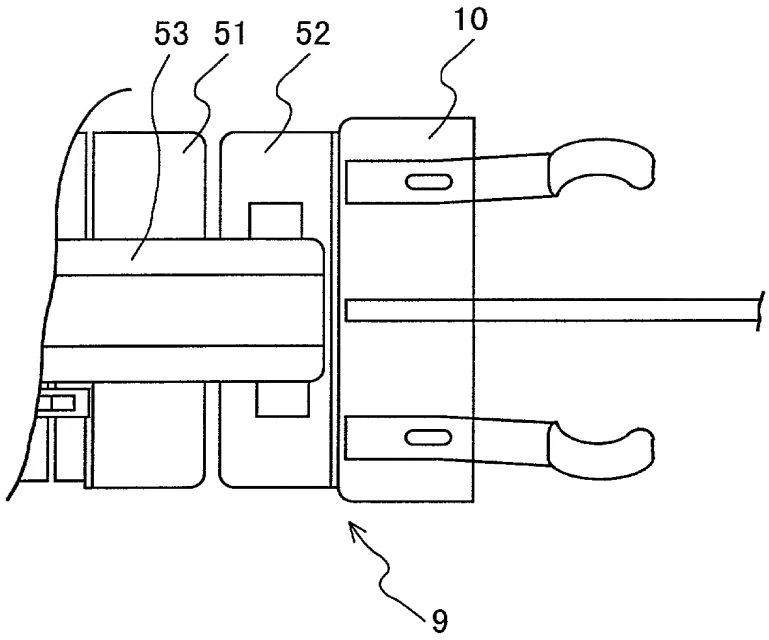

FIG . 2

D9675424 * 090000

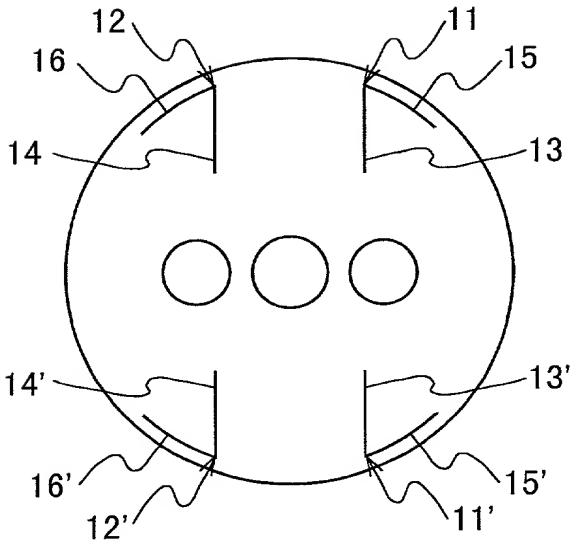

FIG . 3

0962754424 - 092808

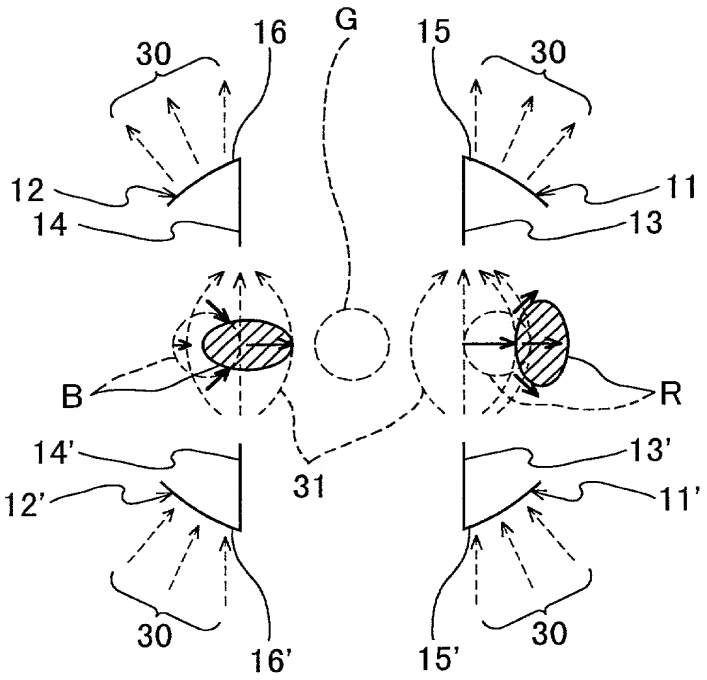

FIG . 4

0967542A1 - 960808

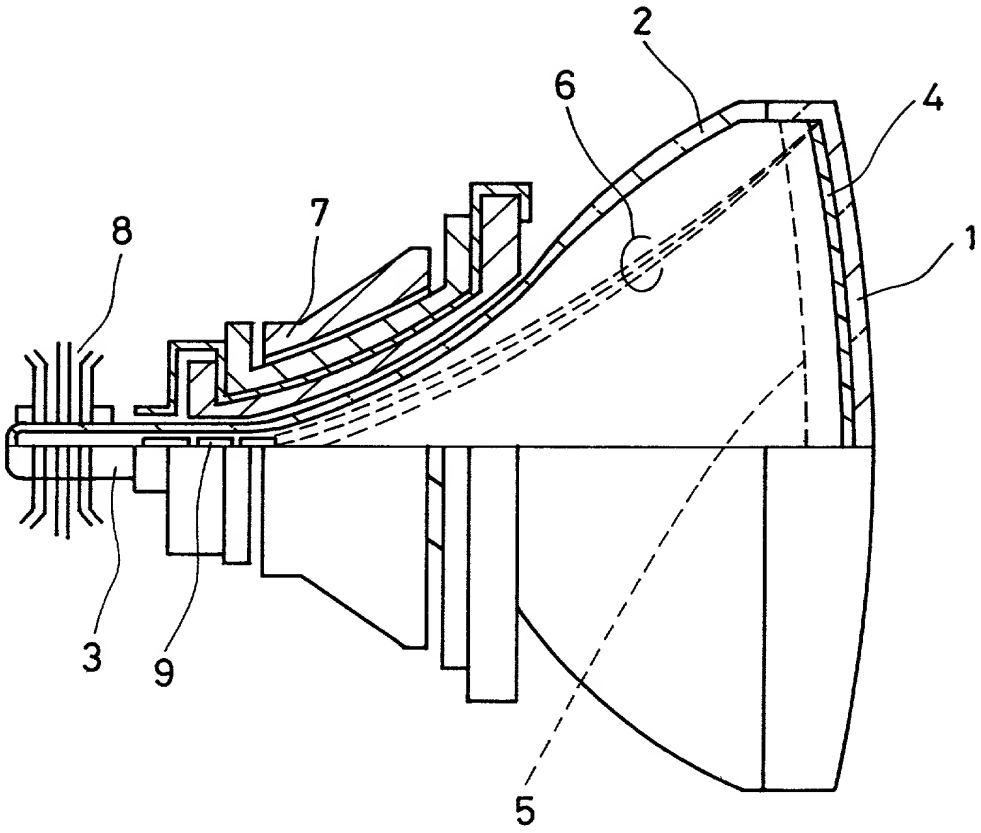

FIG. 5

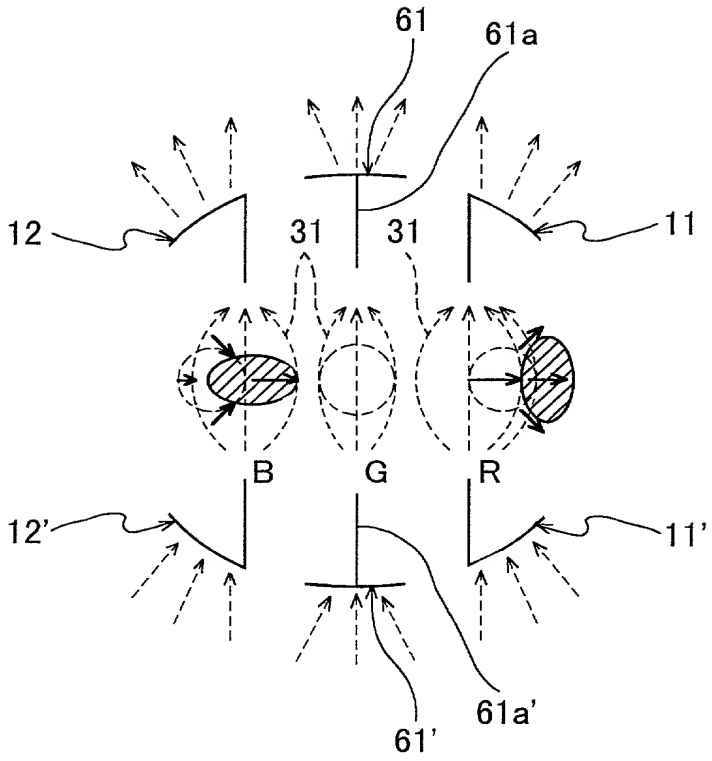

FIG . 6

09675424.090200

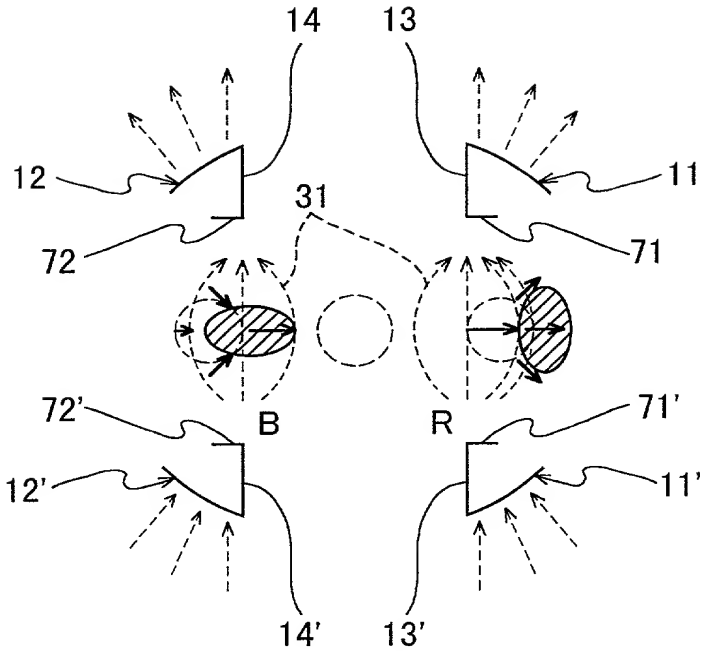

FIG . 7

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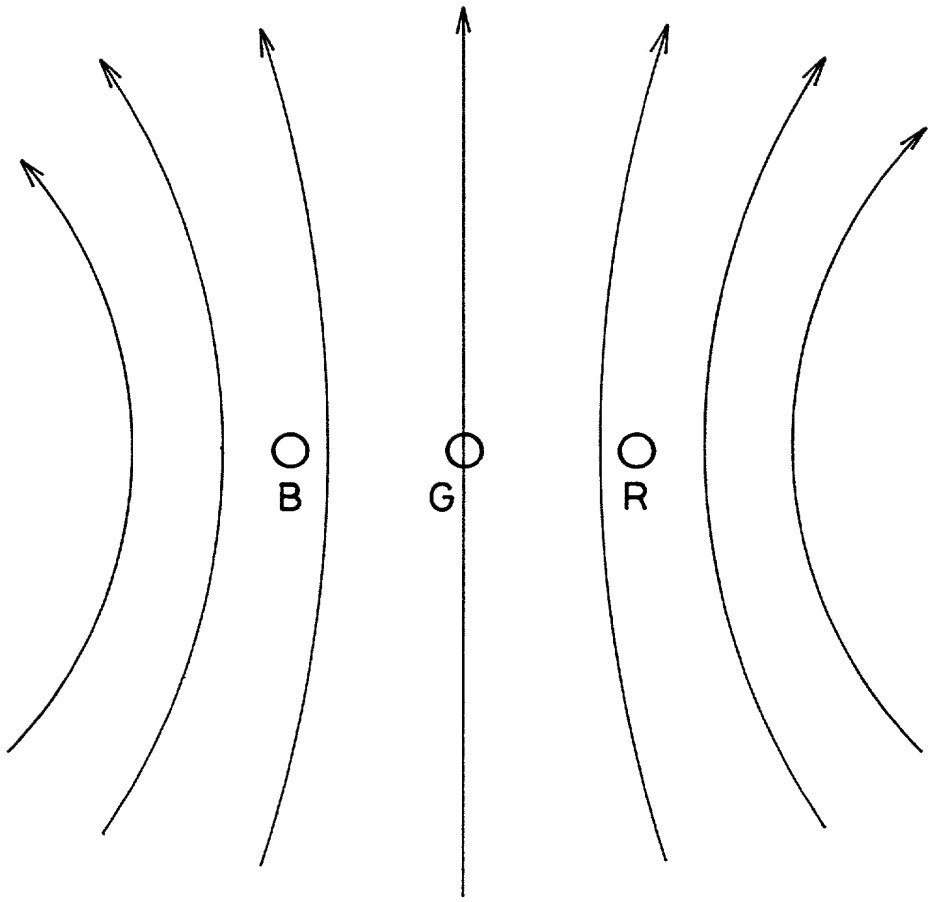

FIG. 8
PRIOR ART

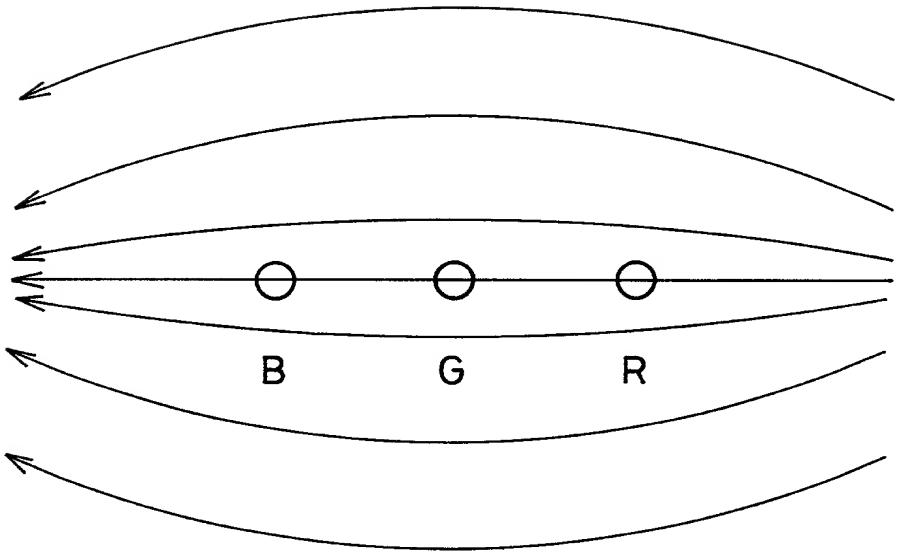

FIG. 9
PRIOR ART

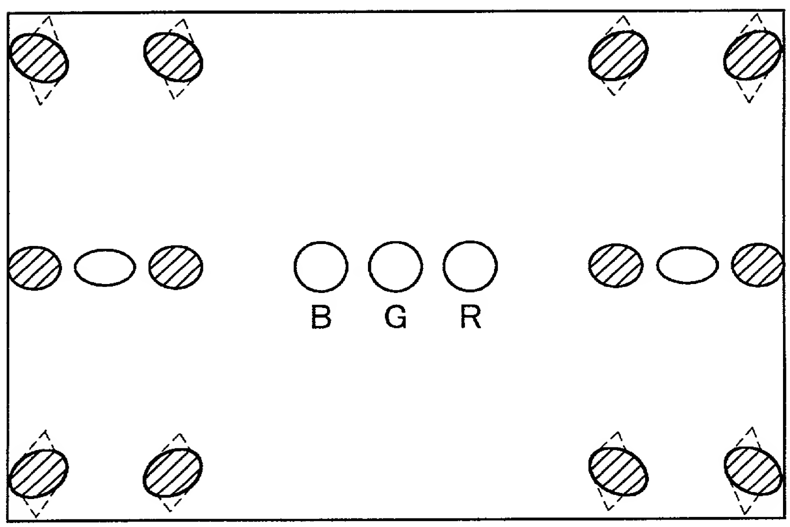

FIG . 10

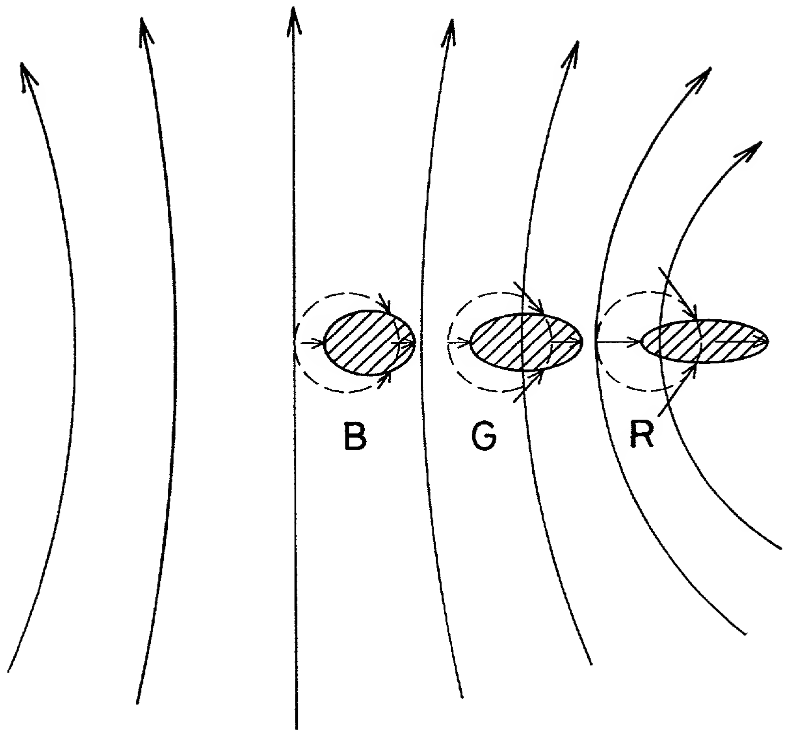

FIG . 11
PRIOR ART

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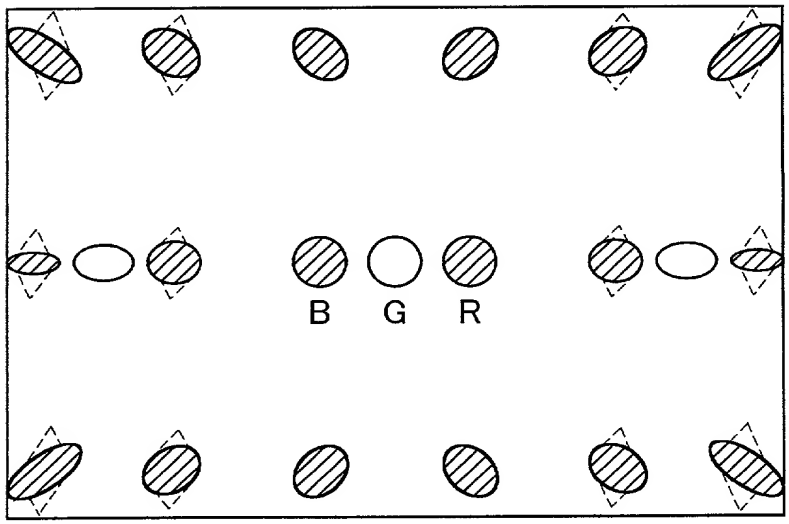

FIG . 12

PRIOR ART

MERCHANT & GOULD P.C.

United States Patent Application

COMBINED DECLARATION AND POWER OF ATTORNEY

As a below named inventor I hereby declare that: my residence, post office address and citizenship are as stated below next to my name; that

I verily believe I am the original, first and sole inventor (if only one name is listed below) or a joint inventor (if plural inventors are named below) of the subject matter which is claimed and for which a patent is sought on the invention entitled: COLOR CATHODE-RAY TUBE AND COLOR CATHODE-RAY TUBE APPARATUS

The specification of which
a. ☒ is attached hereto
b. ☐ was filed on _____ as application serial no. _____ and was amended on
(if applicable) (in the case of a PCT-filed application) described and claimed in international no. _____ filed
and as amended on _____ (if any), which I have reviewed and for which I solicit a United States patent.

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the patentability of this application in accordance with Title 37, Code of Federal Regulations, § 1.56 (attached hereto).

I hereby claim foreign priority benefits under Title 35, United States Code, § 119/365 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on the basis of which priority is claimed:

a. ☐ no such applications have been filed.
b. ☒ such applications have been filed as follows:

FOREIGN APPLICATION(S), IF ANY, CLAIMING PRIORITY UNDER 35 USC § 119			
COUNTRY	**APPLICATION NUMBER**	**DATE OF FILING (day, month, year)**	**DATE OF ISSUE (day, month, year)**
Japan	11-311998	2 November 1999	
ALL FOREIGN APPLICATION(S), IF ANY, FILED BEFORE THE PRIORITY APPLICATION(S)			
COUNTRY	**APPLICATION NUMBER**	**DATE OF FILING (day, month, year)**	**DATE OF ISSUE (day, month, year)**

I hereby claim the benefit under Title 35, United States Code, § 120/365 of any United States and PCT international application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, § 112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, § 1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application.

U.S. APPLICATION NUMBER	DATE OF FILING (day, month, year)	STATUS (patented, pending, abandoned)

I hereby claim the benefit under Title 35, United States Code § 119(e) of any United States provisional application(s) listed below:

U.S. PROVISIONAL APPLICATION NUMBER	DATE OF FILING (Day, Month, Year)

I hereby appoint the following attorney(s) and/or patent agent(s) to prosecute this application and to transact all business in the Patent and Trademark Office connected herewith:

Albrecht, John W.	Reg. No. 40,481	Larson, James A.	Reg. No. 40,443
Anderson, Gregg I.	Reg. No. 28,828	Lasky, Michael B.	Reg. No. 29,555
Ansems, Gregory M.	Reg. No. 42,264	Liepa, Mara E.	Reg. No. 40,066
Batzli, Brian H.	Reg. No. 32,960	Lindquist, Timothy A.	Reg. No. 40,701
Beard, John L.	Reg. No. 27,612	Lynch, David W.	Reg. No. 36,204
Black, Bruce E.	Reg. No. 41,622	Marschang, Diane L.	Reg. No. 35,600
Blasdell, Thomas L.	Reg. No. 31,329	McDaniel, Karen D.	Reg. No. 37,674
Bogucki, Raymond A.	Reg. No. 17,426	McDonald, Daniel W.	Reg. No. 32,044
Bruess, Steven C.	Reg. No. 34,130	McIntyre, Iain A.	Reg. No. 40,337
Byrne, Linda M.	Reg. No. 32,404	Mueller, Douglas P.	Reg. No. 30,300
Carlson, Alan G.	Reg. No. 25,959	Nelson, Albin J.	Reg. No. 28,650
Caspers, Philip P.	Reg. No. 33,227	Pauly, Daniel M.	Reg. No. 40,123
Chiapetta, James R.	Reg. No. 39,634	Phillips, John B.	Reg. No. 37,206
Clifford, John A.	Reg. No. 30,247	Plunkett, Theodore	Reg. No. 37,209
Cochran, William W.	Reg. No. 26,652	Pytel, Melissa J.	Reg. No. 41,512
Daignault, Ronald A.	Reg. No. 25,968	Reich, John C.	Reg. No. 37,703
Daley, Dennis R.	Reg. No. 34,994	Reiland, Earl D.	Reg. No. 25,767
Dalglish, Leslie E.	Reg. No. 40,579	Rittmaster, Ted R.	Reg. No. 32,933
Daulton, Julie R.	Reg. No. 36,414	Schmaltz, David G.	Reg. No. 39,828
DeVries Smith, Katherine M.	Reg. No. 42,157	Schuman, Mark D.	Reg. No. 31,197
DiPietro, Mark J.	Reg. No. 28,707	Schumann, Michael D.	Reg. No. 30,422
Edell, Robert T.	Reg. No. 20,187	Scull, Timothy B.	Reg. No. 42,137
Epp Ryan, Sandra	Reg. No. 39,667	Sebald, Gregory A.	Reg. No. 33,280
Funk, Steven R.	Reg. No. 37,830	Skoog, Mark T.	Reg. No. 40,178
Glance, Robert J.	Reg. No. 40,620	Soderberg, Richard	Reg. No. P- 43,352
Golla, Charles E.	Reg. No. 26,896	Sumner, John P.	Reg. No. 29,114
Gorman, Alan G.	Reg. No. 38,472	Sumners, John S.	Reg. No. 24,216
Gould, John D.	Reg. No. 18,223	Tellekson, David K.	Reg. No. 32,314
Gregson, Richard	Reg. No. 41,804	Trembath, Jon R.	Reg. No. 38,344
Gresens, John J.	Reg. No. 33,112	Underhill, Albert L.	Reg. No. 27,403
Hamre, Curtis B.	Reg. No. 29,165	Vandenburgh, J. Derek	Reg. No. 32,179
Hillson, Randall A.	Reg. No. 31,838	Vradenburgh, Anna M.	Reg. No. 39,868
Holzer, Jr., Richard J.	Reg. No. 42,668	Welter, Paul A.	Reg. No. 20,890
Johnston, Scott W.	Reg. No. 39,721	Wahl, John R.	Reg. No. 33,044
Kadievitch, Natalie D.	Reg. No. 34,196	Whipps, Brian	Reg. No. 43,261
Kastelic, Joseph M.	Reg. No. 37,160	Wickhem, J. Scot	Reg. No. 41,376
Kettelberger, Denise	Reg. No. 33,924	Williams, Douglas J.	Reg. No. 27,054
Knearl, Homer L.	Reg. No. 21,197	Witt, Jonelle	Reg. No. 41,980
Kowalchyk, Alan W.	Reg. No. 31,535	Wood, William J.	Reg. No. 42,236
Kowalchyk, Katherine M.	Reg. No. 36,848	Xu, Min S.	Reg. No. 39,536
Kubota, Glenn M.	Reg. No. 44,197		
Lacy, Paul E.	Reg. No. 38,946		

I hereby authorize them to act and rely on instructions from and communicate directly with the person/assignee/attorney/firm/ organization who/which first sends/sent this case to them and by whom/which I hereby declare that I have consented after full disclosure to be represented unless/until I instruct Merchant & Gould P.C. to the contrary.

Please direct all correspondence in this case to Merchant & Gould P.C. at the address indicated below:

Merchant & Gould P.C.
P.O. Box 2903
Minneapolis, MN 55402-0903

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

2	**Full Name Of Inventor**	**Family Name** IWASAKI	**First Given Name** Katsuyo	**Second Given Name**
0	**Residence & Citizenship**	**City** Hyogo	**State or Foreign Country** Japan	**Country of Citizenship** Japan
1	**Post Office Address**	**Post Office Address** 4-20, Shiroyama, Nishinomiya-shi		**State & Zip Code/Country** Hyogo 662-0023/JAPAN
Signature of Inventor 201: Katsuyo IWASAKI			**Date:** August 25, 2000	

09/644,204 - 082500

JC841 U.S. PTO
09/675121
09/28/00

§ 1.56 Duty to disclose information material to patentability.

(a) A patent by its very nature is affected with a public interest. The public interest is best served, and the most effective patent examination occurs when, at the time an application is being examined, the Office is aware of and evaluates the teachings of all information material to patentability. Each individual associated with the filing and prosecution of a patent application has a duty of candor and good faith in dealing with the Office, which includes a duty to disclose to the Office all information known to that individual to be material to patentability as defined in this section. The duty to disclose information exists with respect to each pending claim until the claim is canceled or withdrawn from consideration, or the application becomes abandoned. Information material to the patentability of a claim that is canceled or withdrawn from consideration need not be submitted if the information is not material to the patentability of any claim remaining under consideration in the application. There is no duty to submit information which is not material to the patentability of any existing claim. The duty to disclose all information known to be material to patentability is deemed to be satisfied if all information known to be material to patentability of any claim issued in a patent was cited by the Office or submitted to the Office in the manner prescribed by §§ 1.97(b)-(d) and 1.98. However, no patent will be granted on an application in connection with which fraud on the Office was practiced or attempted or the duty of disclosure was violated through bad faith or intentional misconduct. The Office encourages applicants to carefully examine:

(1) prior art cited in search reports of a foreign patent office in a counterpart application, and

(2) the closest information over which individuals associated with the filing or prosecution of a patent application believe any pending claim patentably defines, to make sure that any material information contained therein is disclosed to the Office.

(b) Under this section, information is material to patentability when it is not cumulative to information already of record or being made of record in the application, and

(1) It establishes, by itself or in combination with other information, a prima facie case of unpatentability of a claim;

or

(2) It refutes, or is inconsistent with, a position the applicant takes in:

(i) Opposing an argument of unpatentability relied on by the Office, or

(ii) Asserting an argument of patentability.

A prima facie case of unpatentability is established when the information compels a conclusion that a claim is unpatentable under the preponderance of evidence, burden-of-proof standard, giving each term in the claim its broadest reasonable construction consistent with the specification, and before any consideration is given to evidence which may be submitted in an attempt to establish a contrary conclusion of patentability.

(c) Individuals associated with the filing or prosecution of a patent application within the meaning of this section are:

(1) Each inventor named in the application:

(2) Each attorney or agent who prepares or prosecutes the application; and

(3) Every other person who is substantively involved in the preparation or prosecution of the application and who is associated with the inventor, with the assignee or with anyone to whom there is an obligation to assign the application.

(d) Individuals other than the attorney, agent or inventor may comply with this section by disclosing information to the attorney, agent, or inventor.

SCANNED, # 14